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The Kuḍumiyāmalai inscription: a source of early Indian music in notation

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The unique seventh-century rock inscription containing musical notation at Kuḍumiyāmalai, near Puḍukottai, Tamil Nadu, South India, was first published by P. R. Bhandarkar in *Epigraphia Indica* (XII:28) in 1913–14.[1] Bhandarkar recognized the value of this inscription as one of the earliest surviving sources of Indian music in notation, but was unable to explain certain unusual features of the notation. Since then, several attempts have been made at decipherment,[2] none conclusive. The purpose of this study is to offer a new interpretation of the notation, and to present, for the first time, a transcription of the music of the inscription into staff notation.

The hill of Kuḍumiyāmalai, an immense, rounded boulder of naked granite rising from the flat plains south of the river Kāverī, has been a religious site, devoted to the worship of Śiva, since early times. At the foot of the hill stands a masonry temple of the Nāyak period (seventeenth century A.D.). Behind this, a small cave-temple of A.D. seventh- or eighth-century date[3] is cut into the rock. The music inscription, in Pallava-grantha characters of the seventh century, occupies a large rectangular area (some thirteen by fourteen feet) of the smooth, vertical rock face immediately to the left of the cave-temple, with which it may have been associated in function. A later masonry porch, bearing an inscription

[1] The estampage was prepared by H. Krishna Sastri. I have also consulted the version of the text first published in *Inscriptions of the Puḍukottai State*, Puḍukottai 1929 (henceforth *IPS*), and reprinted in R. Sathyanarayana, *The Kuḍimiyāmalai Inscription of Music*, Mysore 1967. According to *IPS* (introduction, p.3), this text was prepared from the *Epigraphia Indica* text and estampage, and then compared with the inscription itself. It differs from the *Epigraphia Indica* text in a number of readings. See, however, the Addendum below, p.142.

[2] C. Minakshi, *Administration and Social Life under the Pallavas*, Madras 1933, pp.239–75; P. Sambamoorthy, *Dictionary of South Indian Music*, vol. II, Madras 1959, pp.344f.; J. R. Marr, 'The Kuṭumiyāmalai Music Inscription', in *Bulletin of the School of Oriental and African Studies* 1972, pp.615–20.

[3] An eighth-century date is favoured by K. R. Venkata Raman, 'A note on the Śittanavāśal and Kuḍimiyāmalai monuments', *Transactions of the Archaeological Society of South India*, 1956–7, pp.87ff.; and a date after the mid-seventh century by K. R. Srinivasan, *Temples of South India*, New Delhi, 1972, pp.55–7.

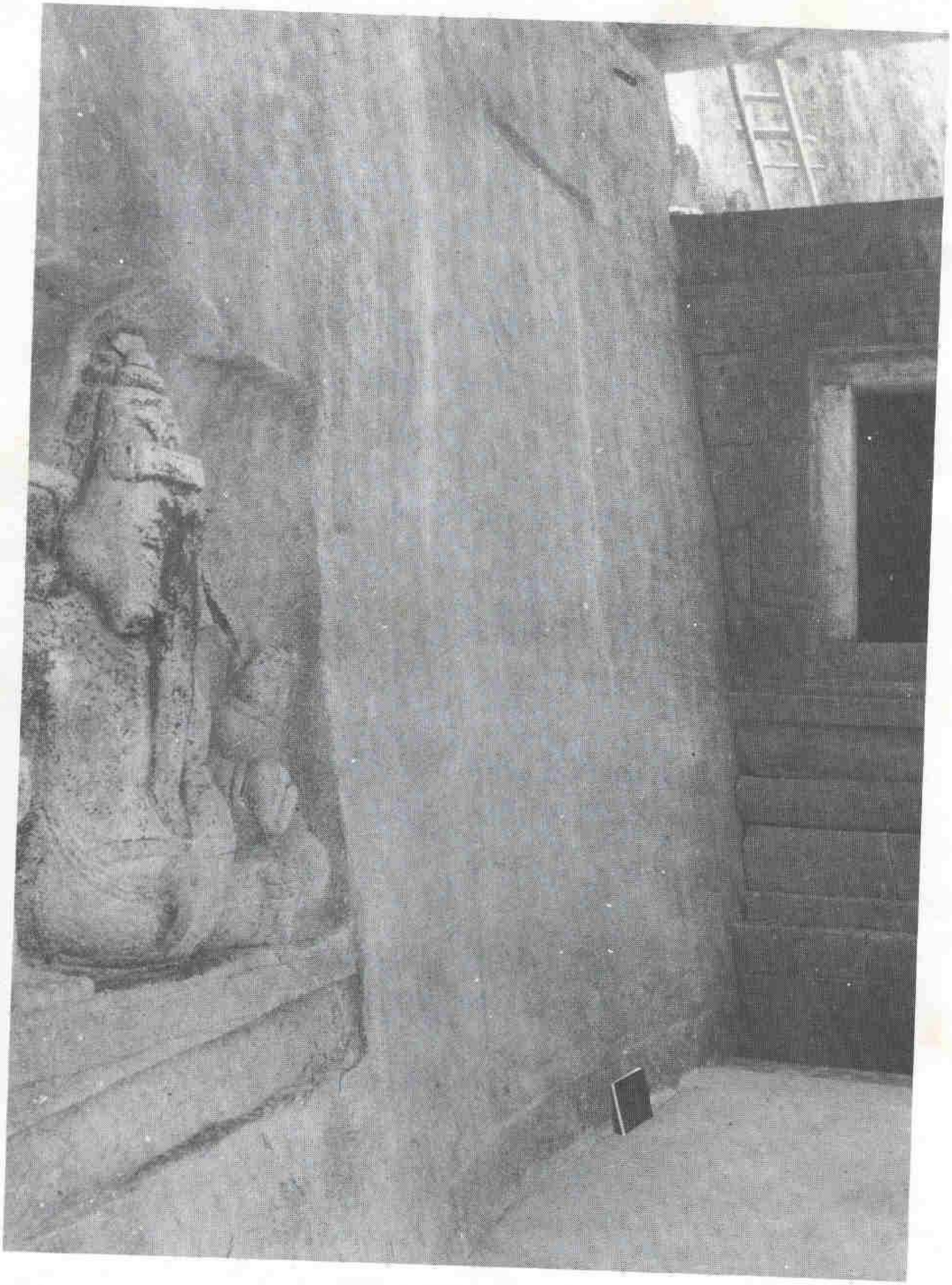

Plate I. Antiquities at Kuḍumiyāmalai. The music inscription occupies the rectangular area of rock-face between the carved figure of Gaṇeśa (left) and the masonry temple-porch (right), both of later date. The inscription is protected by a modern roof. The scale measures 300 cm (horizontal) by 210 cm (vertical). See p.115.

dated 1106,[4] now hides the cave-temple; but fortunately this encroaches only marginally on the music inscription, obscuring a few characters at the ends of lines 32–8, and providing a *terminus ante quem* the inscription fell out of use (see Plate 1, p.116).

The inscription contains 38 horizontal lines of musical notation. Each line reads from left to right and comprises 64 characters representing notes. These notes are disposed in groups of four, the groups separated by small spaces, so that there are 16 groups in each line. The inscription is divided by horizontal rules into seven large sections, each section containing between four and seven lines of notation. The title of each section, in Sanskrit, appears in a column to the left of the notation. At the head of this column is a short salutation to Śiva, and at its foot are two colophons, one in Sanskrit, one in Tamil. The calligraphy is of high quality throughout (see Plate 2, pp.118,119).

The title of each section of the musical notation gives first the name of a mode or *rāga* in the locative case. This is invariably followed by the word *catuṣprahārasvarāgamāḥ*, which may be literally translated: 'texts of notes in four strikings'. *prahāra* may refer to the striking of a percussion or stringed instrument – an interpretation supported by the usage of Sanskrit musicological texts[5] – rather than to a rhythmical beat as such, but I nevertheless take 'four strikings' to refer to the grouping of notes in fours throughout the musical text of the inscription (for Bhandarkar's view, see p.124 below). *svara* refers in musical contexts to one of the degrees of the heptatonic scale (see p.125). *āgama* is best taken in the sense 'didactic text',[6] in view of the reference to 'pupils' in the Sanskrit colophon (see p.121).

Each section may originally have ended with the words *samāptāḥ svarāgamāḥ*, 'the texts of notes are finished', but in all cases these words are partly or wholly obscured by the later masonry.

The rāgas specified in the titles of the seven sections are as follows:

Section I:	Madhyamagrāma
Section II:	Ṣaḍjagrāma
Section III:	Ṣāḍava
Section IV:	Sādhārita
Section V:	Pañcama
Section VI:	Kaiśikamadhyama
Section VII:	Kaiśika

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[4] The East wall has an inscription dated to the 36th year of the reign (1070–*ca* 1118) of Kolottunga Chola I. *Chronological List of the Inscriptions of Puḍukottai State arranged according to Dynasties,* Puḍukottai, 1929 (henceforth *CLIPS*), p.12, no.125.

[5] Cf. Bharata: *Nātyaśāstra* (henceforth BhNŚ) 34.46 and 29.65f. (ed. Ramakrishna Kavi, vol. IV, Baroda 1964 (Gaekwad's Oriental Series no. 145)).

[6] Among meanings for *āgama* given by Böhtlingk and Roth, *Sanskrit-Wörterbuch,* St. Petersburg, 1855, are: 'uberlieferte Lehre, Vorschrift; Sammlung von solchen Lehren *oder* Vorschriften, Lehrbuch'.

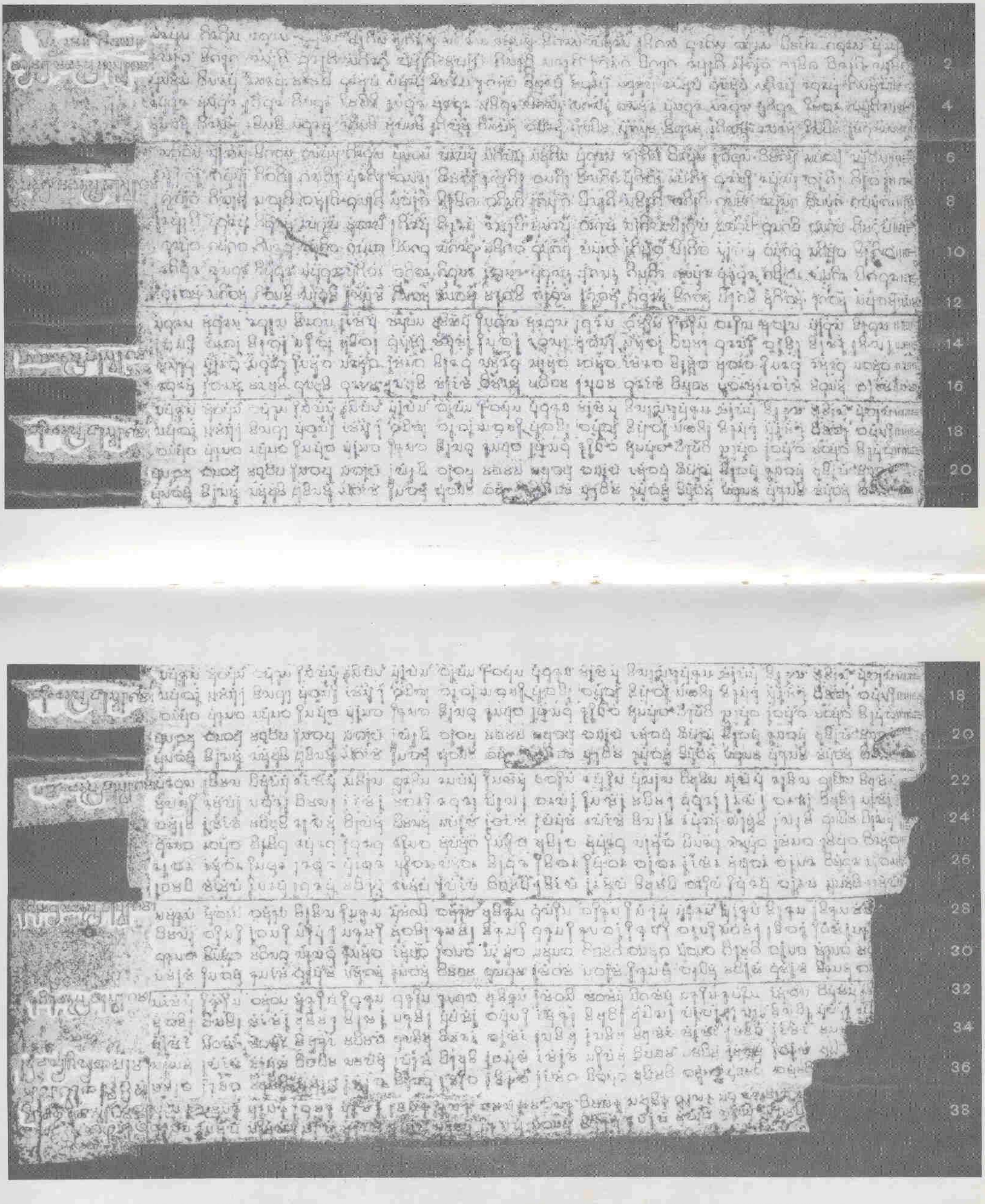
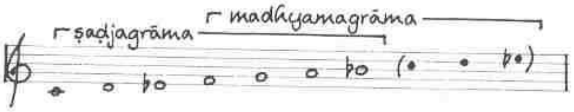


Plate II. The Kuḍumiyāmalai music inscription, reproduced from *Epigraphia Indica* (XII: 28).

These seven modes are mentioned in a number of sources from the mid-first millenium A.D. They do not form part of the system of *jātis* described by Bharata[7] and Dattila[8] in the first half of the millenium, although five of the seven are mentioned by name in a single passage of Bharata's treatise[9] (this may, of course, be a later interpolation). The first securely dated reference is in a Chinese source, the *Suishu*,[10] where five are included in a list of 'Western' modes; thē passage relates to events of the period 561–78. The *Nāradīyā Śiksā* and the *Mārkaṇḍeya Purāṇa*, two texts of indeterminate date within the first millenium,[11] mention all seven modes as *grāmarāgas* ('basic rāgas').[12] In the *Bṛhaddeśī* of Mataṅga[13] they are mentioned as a group of 'pure' (*śuddha*) rāgas at the basis of an extended rāga-system; this text has been attributed to the eighth century.[14] The seven modes, therefore, may be regarded as the earliest rāgas; they were current from at least the sixth century onwards, and were incorporated into the extended rāga-system of the later first millenium.[15]

The rāgas Madhyamagrāma and Ṣaḍjagrāma are not to be confused with the two *grāmas* of the same names. These latter were the two basic scales of early Indian music, or rather, two inversions of the same note-series,[16] shown in Ex. 1 (taking C as arbitrary starting-point).



Example 1

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[7] BhNŚ 28.

[8] Dattila: *Dattilam* (henceforth DD), text, translation and commentary in E. Wiersma-te Nijenhuis, *Dattilam: a Compendium of Ancient Indian Music*, Leiden, 1970, vv. 48–97.

[9] BhNŚ 32.435f. (ed. Śivadatta and Parab, Bombay 1894 (Kāvyamālā 42)).

[10] *Suishu*, ch. 14; trans. R. F. Wolpert, 'Lute Music and Tablatures of the Tang Period', PhD. dissertation, University of Cambridge, pp.106–11. I am indebted to Dr. Wolpert for drawing my attention to this reference; a joint paper is in preparation.

[11] The *Nāradīyā Śikṣā* is dated by E. W. te Nijenhuis ('Musicological Literature', in J. Gonda ed., *A History of Indian Literature*, vol. VI fasc. 1, Wiesbaden 1977, p.20) to the first century A.D. However, the description of *grāmarāgas* in this work can hardly be earlier than the mid-first millenium A.D.

[12] *Nāradīyā Śikṣā* 1. 2. 7 and 1. 4. 5–11; *Markaṇḍeya Purāṇa*, 23. 49–61 (A. Daniélou and N. R. Bhatt, *Textes des Purāṇa sur la théorie musicale*, Pondicherry 1959, p.106–7).

[13] Mataṅga: *Bṛhaddeśī* (henceforth MBD) pp.85–7 (ed. Sambāśiva Śāstrī, Trivandrum 1928 (Trivandrum Sanskrit Series XCIV)).

[14] te Nijenhuis, *op. cit.* (1977) (n.11) p.8.

[15] Further notated examples of these rāgas are preserved in the *Sarasvatīhṛdayālaṃkāra* or *Bharatabhāṣya* of Nānyadeva (*ca* A.D. 1100) and in the *Saṅgītaratnākara* of Śārṅgadeva (*ca* A.D. 1200–1250). Transcriptions of these examples are in preparation.

[16] See N. A. Jairazbhoy, 'An interpretation of the 22 *śrutis*', in *Perspectives on Asian Music: Essays in Honor of Dr. Laurence E. R. Picken*, *Asian Music*, vol. VI, nos. 1 and 2, New York, 1975.

The *grāma* scales provided the tonal material for jātis and rāgas, but were not themselves regarded as melody-types. On the other hand, the Madhyamagrāma and Ṣaḍjagrāma *rāgas* both have F as final, and are distinguished from each other and from other rāgas by characteristic modal dynamics (strong and weak notes, movement of auxiliaries, characteristic phrases etc.)

The Sanskrit colophon reads:

Śrī[17] rudrācāryyaśiṣyeṇa parama
māheśva[re]ṇa rā[jñā] śiṣya
hitārtha(ṃ) kṛtāḥ svarāgamāḥ

'Texts of notes made for the benefit of pupils by the King, who is a devotee of the Supreme Lord (Śiva), and a pupil of Rudrācārya'.

Of Rudrācārya nothing is known, but the anonymous king has been identified as Mahendravarman I, Pallava ruler *ca* 600–630.[18] The principal evidence for this attribution is the similarity of script in a temple-inscription at nearby Tiruchirappalli, which mentions Mahendravarman by name. According to another view, however, both inscription and cave-temple date from the eighth century.[19]

The Tamil colophon, written in Tamil characters of about the seventh century, reads:

[e]ṭṭiṟkum el̤iṟkum [i]vai uriya

'These are appropriate to eight and seven.'

The significance of this colophon, if indeed it relates to the music inscription, is obscure. C. Minakshi[20] proposes that the inscription records music suitable for instruments of seven or eight strings, and draws attention to a fragmentary inscription, in similar characters to the music inscription, within the cave-temple, which gives the single word *parivādinidā*. This may be the name of an instrument of eight strings; but the relationship of this fragment, if any, to the music inscription is not clear. The same word appears in other Pallava inscriptions of the area which do not contain musical notation.[21] It is more probable that the numerals 'eight and seven' refer back to the only other numeral in the inscription, 'four', in 'four strikings', which occurs in the Sanskrit title to each section. The implication may be rhythmical: that the four-beat music of the inscription is in some way adaptable to eight- and seven-beat rhythms. Measures (*kalā*) of four and eight beats (*mātrā*) respectively were used in the *vārtika* and *dakṣiṇa* rhythmic styles of early Indian music.[22] 'Four strikings' may therefore refer to measures of four beats (represented by the grouping of notes in fours throughout the inscription), and the Tamil colophon to measures of eight beats. The numeral seven may refer to a variety of the eight-beat measure, in which a cadence (followed by one beat's rest or prolongation) occurs on the seventh beat. This type is attested in other sources of early Indian music in notation, and occurs very widely in musical cultures of Europe and Asia.[23] The derivation of the seven- from the eight-beat rhythm might explain the inversion of numerical order – 'eight and seven' – in the Tamil colophon.

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[17] According to *IPS*, the syllable *śrī* belongs to another inscription.

[18] Minakshi, Sambamoorthy, Marr (see n. 2).

[19] Venkata Raman *op. cit.* (n. 3).

[20] *op. cit.* p.249.

[21] *CLIPS* p. 1, nos. 3–5.

THE NOTATION

Many examples of Indian music of the pre-Moslem period survive in notation in sources of somewhat later date than the Kuḍumiyāmalai Inscription.[24] Unlike the inscription, these sources have reached us through the manuscript tradition, and are inevitably corrupt; but the system of notation used is very similar to the *sārgam* notation used today.[25] In both systems, syllables from the Sanskrit syllabary are used to denote degrees of the scale, with a minimum of purely graphic signs: a reflection, no doubt, of the prime importance of oral communication in the Indian tradition. Seven solmization syllables represent seven degrees within an octave: *sa ri ga ma pa dha ni*. These related in pre-Moslem times to the grāma note-series as shown in Table I.

An alternative E♮ and B♮ were available in certain contexts (see below p.126). These were called *antara* and *kākalī* respectively, but were not normally distinguished in notation from the standard E♭ and B♭.[26]

The notation of the Kuḍumiyāmalai Inscription resembles that of other sources, in that syllables, based on the seven solmization-syllables *sa ri ga ma pa dha ni*, are used to represent the degrees of the scale. It is unique, however, in two respects:

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[22] BhNŚ 31.5f. (Bombay ed.); DD 116f. The unvarying four-beat style of the inscriptional melodies is reminiscent of the Chinese ritual melodies which survive from the Tang period (A.D. 618–905). See L. E. R. Picken, 'Twelve Ritual Melodies of the T'ang Dynasty', in *Studia Memoria Belae Bartók Sacra*, Budapest, 1956.

[23] Cf. B. Bartók, *Hungarian Folk Music* (trans. Calcovoressi), London 1931, p.28; L. E. R. Picken, 'Secular Chinese Songs of the 12th Century', in *Studia Musicologica Academiae Scientiarum Hungaricae* 8, 1966, pp.167ff.; and L. E. R. Picken, 'Tunes apt for T'ang lyrics from the Shō part-books of Tōgaku', in *Essays in Ethnomusicology*, Korean Musicological Society 1969.

[24] It is hoped to publish transcriptions and analyses in the near future.

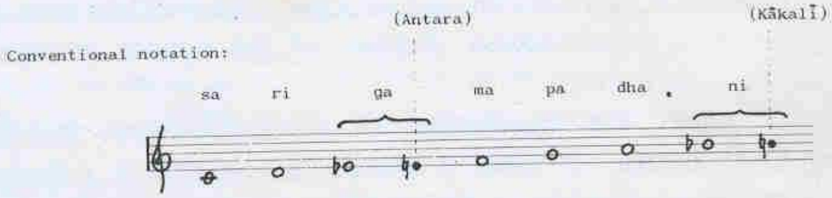
[25] W. Kaufmann, *Musical Notations of the Orient*, vol. I, Indiana 1967, pp.185ff.

[26] Cf. DD 17.

(1) The initial consonant of each syllable may be followed by any one of four vowels: -a, -i, -u, or -e. Thus in place of *sa, ri* etc. we find Sa,[27] Si, Su and Se; Ra, Ri, Ru and Re, and so on. We may say that each of the solmization-syllables is 'inflected' with the vowels -a, -i, -u and -e.

(2) In addition to the 28 symbols thus derived, the inscription also uses the syllables A, U, E, and Ka, Ku, Ke. Bhandarkar suggested that U and E are inflected forms of A, and Ku and Ke of Ka, and that A-[28] and K- represent the notes *antara* and *kākalī* respectively. He was unable to explain, however, the absence of forms inflected with the vowel -i (hypothetically *I and *Ki).

The complete notational system therefore includes 34 different syllables representing notes (see Table I below). In addition, a dot is sometimes written above certain note-symbols – chiefly those inflected -u and -e, and never those inflected -i. This superscript dot is also used in later sources, where it has been interpreted as distinguishing the lowest octave (*sa* to *ni*) of a three-octave range.[29] In modern notation, it marks the highest of three octaves. However, both these interpretations lead to implausible leaps in the melodic line if applied either to the inscription or to other early sources.



Kuḍumiyāmalai:									
-a	Sa	Ra	Ga	A	Ma	Pa	Dha	Na	Ka
-i	Si	Ri	Gi	-	Mi	Pi	Dhi	Ni	—
-u	Su	Ru	Gu	U	Mu	Pu	Dhu	Nu	Ku
-e	Se	Re	Ge	E	Me	Pe	Dhe	Ne	Ke
					Mȧ	Pȧ			
	Su̇	Ru̇	Gu̇	U̇	Mu̇	Pu̇	Dhu̇	Nu̇	
	Sė	Rė	Gė		Mė	Pė			

Table I.

It is convenient to mention at this point two features of the musical organization of the inscription which may be illustrated by a portion of the notation (line 1/i-iv[30]):

Sȧ Ne Pu̇ Sa Gi Ne Gi Sa Ne Dhu Ne Sa Mu̇ Pu̇ Ne Sa (etc.)

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[27] Note-symbols from the Kuḍumiyāmalai Inscription are distinguished in this study by a capital initial.

[28] The convention S-, etc., will be used to denote 'any or all of the forms Sa, Si, Su and Se', etc.

[29] Cf. te Nijenhuis, *op. cit.* 1970 (n. 8), pp.426ff. and transcriptions pp.413ff.

[30] Lines of the inscription are referred to by Arabic numerals 1–38, and measures of a line by small Roman numerals i–xvi.

First, throughout any one line, the same initial consonant (in this case S-) occurs in the final note-syllable of every group of four: in other words, the final note in every group, or measure, is a form of the same scale-degree. Secondly, within each measure, immediate repetition of an initial consonant (for example: M- M-) is consistently avoided. Similarly, repetition of the same vowel-inflection (for example: -u -u) is confined to the -u and -a inflections, and only extends to two (occasionally three) consecutive symbols. Movement from note to note is therefore from one scale-degree, bearing one vowel-inflection, to a different scale-degree, usually bearing a different vowel-inflection.

PREVIOUS INTERPRETATIONS

The significance of the vowel-inflections is not explained either in the inscription itself or by any contemporary document. Bhandarkar suggested that 'the music in the inscription appears to be intended for the *vīṇā*, since it has been given the title *catuṣprahārasvarāgamāḥ* or authoritative texts of notes produced by four *strikings* (of the string); and I think the vowel endings may indicate the particular ways of striking or plucking the string'. Subsequent writers have ignored this suggestion, and have instead associated the multiple note-symbols of the inscription with a microtonal division of the octave. Neither of these interpretations is satisfactory.

Table II shows the distribution of vowel-inflections throughout the inscription. The number of times a solmization-syllable is inflected with a particular vowel is expressed as an approximate percentage of the total number of occurrences of that solmization-syllable. Thus 56 per cent of all occurrences of S- have the vowel-inflection -a. In this table, as in all subsequent tables, uncertain readings and lacunae (amounting to about 7 per cent of the text) are ignored.

	-a	-i	-u	-e	
S-	56	2.5	17	25	%
R-	43	21	24	11	%
G-	26.5	46.5	7	19.5	%
M-	19	22.5	35.5	22.5	%
P-	6	16	44	33	%
Dh	3.5	10	31.5	54.5	%
N-	24	3.5	5.5	66.5	%
A-	32.5	0	49	18.5	%
K-	5.5	0	8	86.5	%

Table II.

The table shows that there are marked preferences for particular vowels in association with particular consonants: the preferred consonant-vowel combinations are boxed in the table. It is most unlikely that particular ways of plucking the string would be so strongly associated with particular degrees of the scale: there is no textual evidence for such an association.

Table III shows the attempts of P. Sambamoorthy and J. R. Marr[2] to reconcile the 34 symbols of the notation-system with the ancient Indian division of the octave into 22 microtonal degrees (*śruti*). According to this view, which is also held by Minakshi,[31] the consonant-element S-, for example, embraces four consecutive microtonal degrees distinguished by the vowels -a, -i, -u, -e. The symbols A- and K- are ignored, and the remaining 28 symbols are accommodated to the 22 *śrutis* by duplication in some cases. Authority for this duplication is sought in the 12-note division of the octave and its associated nomenclature attributed to Govinda Dikṣita (seventeenth century A.D.), which is still used in South India today, and which shows inflection of note-symbols with the vowels -a, -i, and -u. This is also shown, for comparison, in Table III.

Śrutis:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'	'
(Sambamoorthy)																					
Sa	Si	Su	Se						Ma	Mi	Mu	Me	Pa	Pi	Pu	Pe					
			Ra	Ri	Ru	Re										Dha	Dhi	Dhu	Dhe		
					Ga	Gi	Gu	Ge										Na	Ni	Nu	Ne
(Marr)																					
Se	Su	Si	Sa	Re	Ru	Ri	Ra		Me	Mu	Mi	Ma	Pe	Pu	Pi	Pa				Ne	Ni
Nu	Na				Ge	Gu	Gi	Ga								Dhe	Dhu	Dhi	Dha		

Govinda Diksita's nomenclature:

semitones:

1	2	3	4	5	6	7	8	9	10	11	12
'	'	'	'	'	'	'	'	'	'	'	'
Sa	Ra	Ri	Ru		Ma	Mi	Pa	Dha	Dhi	Dhu	
		Ga	Gi	Gu					Na	Ni	Nu

Table III.

This view, however, is open to a fundamental objection. We have already seen that the inscription demonstrates seven early rāgas, current during the mid first millenium A.D. To this extent, at least, the inscription reflects contemporary musical practice. However, it is clear that the ancient division of the octave into 22 microtones was a purely theoretical construction, never realised as such in practice. N. A. Jairazbhoy has recently shown[16] that although the microtones were considered in theory to be equal, this concept could not be reconciled in practice with the fully-recognised consonance of fourth and fifth. In any case, the microtonal division of the octave was used only to define the intervallic structure of the heptatonic grāma series: in other words, to define the intervallic relationship of the seven notes *sa, ri, ga, ma, pa, dha* and *ni,* and the alternative notes *antara* and *kākalī*. These notes, the *svaras*, thus fixed, were not variable in pitch relative to one another; they alone provided the tonal material for all jātis and rāgas. 'A single *śruti* appears to have been conceived as the highest common factor of the existing intervals, and not as a musical tone in its own right . . . . the fact that *sa* had four *śrutis* [that is, was four microtones higher than *ni*] did not necessarily imply that there were three other musical intervals between *sa* and *ni*.'[16] The hypothesis that the music of the inscription uses all the degrees of the theoretical *śruti*-scale appears to rest on a misconception of the purpose of that scale. It also overlooks the explicit indication of the Sanskrit title of each section of the inscription: that the music is composed in specific rāgas, and therefore comprises 'texts of *notes*' (*svara*), not of microtones (*śruti*).

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[31] Minakshi holds that each modal section of the inscription selects 22 *śrutis* out of a hypothetical 28. This theory is demonstrated in a table (p.266), which cannot, however, be reconciled with the text of the inscription.

The same hypothesis takes no account of the fact, already demonstrated, that certain consonant-vowel combinations occur more frequently than others (Table II); nor does it account for the symbols A- and K-, or for the absence of the forms *I and *Ki. As for the modern South Indian nomenclature, this is not attested before the seventeenth century A.D.

One may therefore conclude that neither the interpretation of the vowel-inflections offered by Bhandarkar nor the 'microtone theory' is likely to be correct, and that some other explanation of the vowel-inflections must be found.

ANTARA AND *KĀKALĪ*

The assumption of Bhandarkar that A- and K- correspond to the alternative scale-degrees *antara* and *kākalī* cannot seriously be challenged. Indeed, this identification proves the key to the understanding of the vowel-inflections, as will be shown. Bhandarkar pointed out that A- and K- occur for the most part in those rāgas for which *antara* and *kākalī* respectively are prescribed in the *Nāradīya Śikṣā*. He might have added that in those sections where A- occurs, G- is absent, and where K- occurs, N- is absent, as though A- were an alternative form of G- and K- of N-. This situation evidently reflects the statements of Bharata, that *antara* and *kākalī* are sharpened forms of *ga* and *ni* respectively,[32] and only occur where *ga* and *ni* are weak (that is, infrequent) notes of the mode.[33] It is also stated that *antara* and *kākalī* were themselves weak notes.[34] This is reflected in the inscription, for example in the Sādhārita rāga, where the frequency of the notes used is as follows:

Notes used:	S-	R-	M-	P-	Dh-	A-	K-
Number of occurences:	56	53	46	56	65	10	11

In this section, as in other sections of the inscription where A- and K- occur, these two notes are considerably less frequent than the other notes used.

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[32] BhNŚ 28.35 (ed. M. Ghosh, vol. II, Calcutta 1956 (Bibliotheka Indica no. 272A)).

[33] BhNŚ 28.37 (Bombay ed.).

[34] BhNŚ 28.35 (Baroda ed.).

Furthermore, as Bhandarkar observed, they do not occur as a final note of any rāga, and as the final note of four-note measures they occur only in the last rāga, Kaiśika.

It has not previously been remarked that in the Kuḍumiyāmalai Inscription the notes A- and K- fulfil a special function: that of leading-notes to M- and S- respectively. That is, A- (E♮) is almost always followed immediately by M- (F), and K- (B♮) by S- (C). This leading-note function may be reflected in the statement of Bharata[35] that *antara* and *kākalī* should be used only in the ascending scale. Jairazbhoy has observed[36] that a tendency to sharpen the seventh degree as a leading-note to the tonic is noticeable in many modern North Indian rāgas, particularly those in the Khamāj and Kāfī scales (which resemble the ancient Madhyamagrāma and Ṣaḍjagrāma series respectively), and suggests that this represents a survival of the ancient *antara* and *kākalī*. One may also compare the sharpened leading-notes of mediaeval *musica ficta* in the West, or the *bian* notes of Chinese music.

The evidence suggests, therefore, that A- and K- in the Kuḍumiyāmalai Inscription correspond to *antara* and *kākalī* respectively; that these notes are sharpened forms of *ga* and *ni*, used as leading-notes to *ma* and *sa*; and that they are used relatively infrequently and only in those rāgas in which the standard *ga* and *ni* do not occur.

THE VOWEL NOTATION

The identification of *antara* and *kākalī*, and of their function in the music of the inscription, enables us to propose a new interpretation of the vowel-inflections. It will be convenient to refer to the stages in the argument as §§1 – 20.

§1. It has been argued that the vowel-inflections do not indicate any microtonal variation in the pitch of the basic scale-degrees. Thus whatever meaning may be assigned to the vowels, all forms of S-, for example, must be equated with one and the same scale-degree. It would therefore be possible to attempt a transcription of the music of the inscription into staff notation, using for example the values suggested above in Table I: thus all forms of S- would be transcribed as C, all forms of R- as D, and so on.

§2. A difficulty with this procedure, however, is that the direction of each successive step is unknown. Thus the notes S- R-, for example, could be transcribed as a rising second (c′ d′), as a falling seventh (c′ d), as a rising ninth (c d′), or as even larger intervals. Each melodic step can be interpreted as either a rising or a falling interval, and as a relatively small interval or as a larger inversion. All that can be predicted at this stage is that in view of the prime importance of vocal music in India, in ancient times as today, the music (even if instrumental) is likely to be confined to the vocal range (three octaves according to theoretical texts[37]), and that for the same reason, the smaller intervals – second, third and fourth – are likely to be more frequent than their larger, less easily sung inversions – seventh, ninth etc.

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[35] BhNŚ 28.35 (Ghosh ed.).

[36] N. A. Jairazbhoy, *The Rāgs of North Indian Music*, London 1971, pp.113ff.

§3. The statement that the direction of each successive melodic step is unknown, must be modified in view of the special function of *antara* and *kākalī*. It has been shown that A- and K- in the inscription fulfil the traditional role of *antara* and *kākalī* as leading-notes to the notes next above in scale order. According to Bharata, these notes were used only in the context of ascending movement. We may therefore positively identify the intervals A- M- and K- S- (equivalent pitches: E♮ F, B♮ C) as ascending semitones.

The first rāga of the inscription, Madhyamagrāma, does not employ A- or K- (since both G- and N- are strong). However, the notes R- and Dh- are of less frequent occurrence than the other notes of the rāga, and almost invariably lead directly to the notes next above in scale order (G- and N- respectively). They fulfil, therefore, a role similar to that of A- and K- in other rāgas. For this reason we may also regard the intervals R- G- and Dh- N- (equivalent pitches: D E♭ , A B♭) in the Madhyamagrāma rāga as rising semitones.

§4. Table IV shows, on the horizontal axis, all the possible sequences of two vowel-inflections (including repetition of the same vowel); and on the vertical axis, the number of times each sequence is associated with the intervals A- M-, K- S- and in the Madhyamagrāma rāga, R- G- and Dh-N-. Thus the sequence Ke Sa (for example), which comprises the interval K- S- (B♮ C♮) combined with the vowel-sequence -e -a, occurs 41 times in the inscription. At the foot of each column, a total indicates the number of times each vowel-sequence occurs in association with all the intervals in question. Thus the sequence -e -a occurs 57 times in all in combination with A- M-, K- S-, R- G- and Dh-N-.

Note-sequence	Equivalent pitches	Vowel-sequences															
		-a -a	-a -i	-a -u	-a -e	-i -a	-i -i	-i -u	-i -e	-u -a	-u -i	-u -u	-u -e	-e -a	-e -i	-e -u	-e -e
A- M-	E♮ F	1	21	0	1	0	0	0	0	2	1	9	24	12	0	0	0
K- S-	B♮ C	0	3	0	1	0	0	0	0	1	0	0	5	41	0	2	0
R- G-*	D E♭	0	11	0	1	0	0	0	0	0	0	0	3	3	0	0	0
Dh- N-*	A B♭	0	0	0	0	0	0	0	0	0	0	0	20	1	0	0	0
	Total	1	35	0	3	0	0	0	0	3	1	9	52	57	0	2	0

* Section I (Madhyamagrāma) only

Table IV.

Leaving aside the sequences A Ma and U Mu, which will be considered later (§13), one can say on the basis of Table IV that the only vowel-sequences that occur with any frequency in the context of intervals identified as rising semitones, are -a -i, -u -e, and -e -a. (The isolated occurrence of other vowel-sequences may be due to errors in the notation, or to exceptional circumstances in which these intervals are not rising semitones.)

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[37] Cf. DD 8; MBD p.7, ll.1–4; etc.

§5. The relationship between particular vowel-sequences and particular intervals, suggested by Table IV, may be hypothetically explained by ranking the vowels in the following order, with -i in highest place and -u in lowest:

-i
-a
-e
-u

As we have already seen (§4), vowel-sequences comprising adjacent vowels in ascending rank order (-u -e, -e -a and -a -i) are associated with rising intervals. It may be expected therefore, that the reverse of these sequences (-i -a, -a -e, and -e -u) will be associated with falling intervals. Similarly it is possible that vowel-sequences comprising non-adjacent vowels in ascending rank order (-u -a, -e -i and -u -i) are associated with rising intervals, and the reverse sequences (-i -e, -a -u and -i -u) with falling intervals.

This hypothesis accounts for all possible sequences of two different vowels (repeated vowels will be considered in §13). They may be tabulated as follows:

'Rising' vowel-sequences:				
(ascending rank order of vowels:	-u	-e	-a	-i)
adjacent vowels:	-u.....-e			
		-e.....-a		
			-a.....-i	
non-adjacent vowels:	-u............-a			
		-e............-i		
	-u...................-i			
'Falling' vowel-sequences:				
(descending rank order of vowels:	-i	-a	-e	-u)
adjacent vowels:	-i.....-a			
		-a.....-e		
			-e.....-u	
non-adjacent vowels:	-i............-e			
		-a............-u		
	-i...................-u			

Table V.

§6. It has been predicted (§2) that small intervals – seconds, thirds and fourths – are likely to be more frequent than their larger inversions. Thus S- R- (equivalent pitches: C D), for example, is likely to represent a rising second more often than a falling seventh, a rising ninth, or larger inversions. If we examine all cases of S- R- in the inscription, therefore, we should expect the hypothetical interpretation of the vowel-inflections, if it is correct, to yield a rising interval in the majority of cases. In other words, we should expect S- R- to be most often associated with the vowel-sequences listed under 'rising' vowel-sequences in Table V. We should expect a similar result from the analysis of all note-sequences involving adjacent, ascending scale-degrees (C D, D E, E F etc.).

Conversely, the note-symbols R- S- (D C) are likely to represent a falling second more often than a rising seventh, a falling ninth, or larger inversions. We should therefore expect R- S- to be associated most often with the vowel-sequences listed under 'falling' vowel-sequences in Table V. The same result should also be obtained from the analysis of all note-sequences involving adjacent, descending scale-degrees (C B, B A, A G etc.).

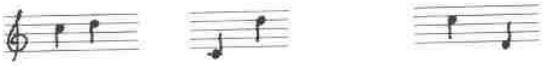
The same preference for small over large intervals, if observed in the music of the inscription, is to be expected in the case of note-sequences involving non-adjacent scale-degrees: that is, thirds, sixths, tenths etc. (for example: C E, D F, E G etc.), and fourths, fifths, elevenths etc. (for example: C F, D G, E A etc.).

These expectations are tested in §§7 – 13.

§7. Table VIa shows the number of times the note-sequence S- R- (C D) is combined with each vowel-sequence.

Note-Sequence	Equivalent pitches	Vowel-sequences*														
		Repeated**			'Rising'						'Falling'					
					adjacent			non-adjacent			adjacent			non-adjacent		
		-a -a	-e -e	-u -u	-u -e	-e -a	-a -i	-u -a	-e -i	-u -i	-i -a	-a -e	-e -u	-i -e	-a -u	-i -u
S- R-	C D	5	0	11	9	21	27	0	2	4	0	1	0	0	8	0
	Total	16			57			6			1			8		
					63						9					

Interpretation: (see §13) Rising second Rising ninth Falling seventh



*cf. Table V

** the sequence -i -i does not occur

Table VIa.

As expected (§6), the note-sequence S- R- occurs most frequently – 63 times – in combination with 'rising' vowel-sequences (as defined in §5), as against only 9 occurrences in combination with 'falling' vowel-sequences. Of the 'rising' sequences, the adjacent type occur 57 times, the non-adjacent only 6 times. The adjacent type may therefore be interpreted as indicating the rising second, and the non-adjacent the rising ninth. Of the 'falling' sequences, seven are of the non-adjacent type, and may be interpreted as representing a falling seventh. The one 'falling' sequence of adjacent type may also represent the falling seventh, since no smaller descending interval is possible. These interpretations are shown in staff notation at the foot of the table.

§8. Table VIb shows a similar analysis of *all* note-sequences involving adjacent scale-degrees in ascending scale order (C D, D E, E F etc.). In every case, the results are similar to those obtained in Table VIa. The note-sequences occur more frequently in combination with 'rising' vowel-sequences (a total of 415 times) than with 'falling' (only 37 times). Within the 'rising' category adjacent vowel-sequences (seconds?) occur 392 times, as against 23 non-adjacent (ninths?). Of the 'falling' vowel-sequences, the non-adjacent occur 27 times, the adjacent 10 times; both these types may represent falling sevenths.

Note-sequence	Equivalent pitches	Vowel-sequences														
		Repeated			'Rising'						'Falling'					
					adjacent			non-adjacent			adjacent			non-adjacent		
		-a -a	-e -e	-u -u	-u -e	-e -a	-a -i	-u -a	-e -i	-u -i	-i -a	-a -e	-e -u	-i -e	-a -u	-i -u
S- R-	C D	5	0	11	9	21	27	0	2	4	0	1	0	0	8	0
R- G/A-	D E	3	0	8	12	9	21	2	1	1	0	1	0	0	1	2
G/A- M-	E F	1	0	9	25	16	23	2	2	1	0	2	0	0	1	0
M- P-	F G	1	0	4	18	0	15	0	2	3	0	1	0	2	2	2
P- Dh-	G A	0	0	9	31	0	2	0	1	1	0	0	1	4	0	2
Dh- N/K-	A B	0	0	0	60	28	0	0	0	0	0	0	0	2	0	0
N/K- S-	B C	0	1	1	7	65	3	1	0	0	0	1	3	1	0	0
	Total	10	1	42	162	139	91	5	8	10	0	6	4	9	12	6
			53			392			23			10			27	
							415						37			

Table VIb.

§9. Table VII shows an analysis of all note-sequences involving adjacent scale-degrees in *descending* order – that is, the reverse of the note-sequences analysed in Table VI. Here, as predicted (§6), *the results are different from those obtained for adjacent scale-degrees in ascending scale order* (§§7–8). The most frequent vowel-sequences are the 'falling', adjacent type (231 occurrences), which may be identified as representing falling seconds. A further 14 occurrences of 'falling', non-adjacent vowel-sequences may represent falling ninths. 'Rising' vowel-sequences occur 46 times, of which 36 are of the non-adjacent, and 10 of the adjacent type; these may all represent rising sevenths.

Note-sequence	Equivalent pitches	Vowel-sequences														
		Repeated			'Rising'						'Falling'					
					adjacent			non-adjacent			adjacent			non-adjacent		
		-a -a	-e -e	-u -u	-u -e	-e -a	-a -i	-u -a	-e -i	-u -i	-i -a	-a -e	-e -u	-i -e	-a -u	-i -u
S- N/K-	C B	0	1	0	2	1	0	2	0	0	0	34	10	0	0	0
N/K- Dh-	B A	0	0	0	0	0	0	0	1	1		13	27	0	0	0
Dh- P-	A G	0	0	0	1	0	0	0	2	0	4	0	17	0	0	1
P- M-	G F	2	0	0	0	0	0	4	2	4	10	1	16	1	0	1
M- G/A	F E	0	0	0	0	1	0	3	1	5	12	6	12	1	1	1
G/A- R-	E D	0	0	0	0	1	1	2	0	0	10	3	4	0	1	2
R- S-	D C	1	0	0	0	2	1	10	1	0	31	17	4	1	3	1
	Total	3	1	0	3	5	2	21	5	10	67	74	90	3	5	6
						10			36			231			14	
							46						245			

Table VII.

§10. Tables VI and VII fulfil the expectations set out in §6: in the context of the note-sequences examined, the hypothetical interpretation of the vowel-sequences yields a small interval (a rising or falling second) in the majority of cases. The same test may be applied to note-sequences involving non-adjacent scale-degrees.

§11. Table VIII shows the distribution of vowel-sequences in connection with thirds or their inversions: C E, D F, E G etc. and C A, B G, A F etc.

Note-sequence	Equivalent pitches	Vowel-sequences				
		Repeated	'Rising'		'Falling'	
			adjacent	non-adj.	adjacent	non-adj.
S- G/A-	C E	2	34	5	2	6
R- M-	D F	0	43	9	3	4
G/A- P-	E G	0	17	3	1	5
M- Dh-	F A	0	46	5	4	15
P- N/K-	G B	0	24	1	0	1
Dh- S-	A C	6	60	8	4	6
N/K- R-	B D	0	22	9	1	2
	Total	8	246	40	15	39
			286		54	
S- Dh-	C A	0	5	2	57	20
N/K- P-	B G	0	0	1	46	0
Dh- M-	A F	0	3	13	41	1
P- G/A-	G E	0	0	7	11	3
M- R-	F D	0	4	10	38	7
G/A- S-	E C	0	1	1	35	5
R- N/K-	D B	1	3	3	7	10
	Total	1	26	47	235	46
			73		281	

Table VIII.

The table shows that the note-sequences C E, D F, E G etc., all of which may be interpreted as rising thirds, are associated in a large majority of cases (about 5:1) with 'rising' vowel-sequences, while C A, B G, A F etc., which may represent falling thirds, are associated in a similar proportion of cases with 'falling' vowel-sequences. These preferences may be explained as fulfilling the prediction (§3) that small intervals are likely to be more frequent than their larger inversions. The non-adjacent vowel-sequences may represent, in some cases (see §14), tenths rather than thirds; but they occur less frequently than the adjacent sequences.

§12. Table IX is a similar presentation of all note-sequences representing fourths or their inversions (C F, D G, E A etc. and C G, B F, A E etc.).

This table suggests that while falling fourths predominate over rising fifths in the proportion of about 5:2, rising fourths and falling fifths are of almost equal frequency. The preference for small intervals in these cases is less marked than in the case of seconds, thirds and their inversions, partly no doubt because there is little difference in size between the small interval (fourth) and its inversion (fifth). Again, larger inversions – elevenths, twelfths – may be indicated by some of the non-adjacent vowel-sequences (see §14).

Note-sequence	Equivalent pitches	Vowel-sequences				
		Repeated	'Rising'		'Falling'	
			adjacent	non-adj.	adjacent	non-adj.
S- M-	C F	0	23	12	20	6
R- P-	D G	1	19	1	10	11
G/A- Dh-	E A	0	4	1	14	21
M- N/K-	F B	0	26	3	1	9
P- S-	G C	1	14	17	18	7
Dh- R-	A D	0	16	14	30	4
N/K- G/A	B E	2	3	9	7	2
	Total	4	105	57	100	60
			162		160	
S- P-	C G	1	2	6	10	17
N/K- M-	B F	0	1	7	18	4
Dh- G/A-	A E	0	4	5	6	5
P- R-	G D	0	4	7	14	7
M- S-	F C	1	6	12	28	11
G/A- N/K-	E B	0	1	1	7	11
R- Dh-	D A	0	11	4	21	26
	Total	2	29	42	104	81
			71		185	

Table IX.

§13. Every note-sequence in the inscription (with the exception of octaves, which are of equal size whether ascending or descending, and of uncertain readings) has now been considered (§§7–12) in the light of the hypothetical interpretation of vowel-sequences proposed in §5. The results of this interpretation appear to fulfil the prediction (§3) that small intervals are likely to be more frequent than their larger inversions. One may therefore conclude that the hypothesis is likely to be correct.

The question of repeated vowels has been left on one side, but in view of the predominance of small intervals, they may be assumed to imply the smallest available interval, whether ascending or descending. In fact, repeated vowels occur in significant numbers only in association with the note-sequences C D, D E, E F etc. and C E, D F, E G etc., all of which may be interpreted as small, rising intervals (cf. Tables VI–IX). It may therefore be a convention of the notation that a repeated vowel indicates a small, rising interval. It is not clear why the -e vowel is rarely, and the -i vowel never, repeated.

§14. So far, we have only considered the use of the vowel-inflections in the notation of isolated intervals. We are now able to see how they function in the notation of the melodic line *in extenso*.

Ex. 2 shows a portion of the musical text of the inscription. Below this, the vowel-inflections are isolated from the consonant elements; their sequence is

Dhe Sa Pu Dhe   Pu Ke Sa Dhe   Sa Pu Sa Dhe   Ri Sa Pu Dhe   (1. 19/1-1v)

-e ↗ -a ↘ -u ↗ -e ↘ -u ↗ -e ↗ -a ↘ -e ↗ -a ↘ -u ↗ -a ↘ -e ↗ -i ↘ -a ↘ -u ↗ -e

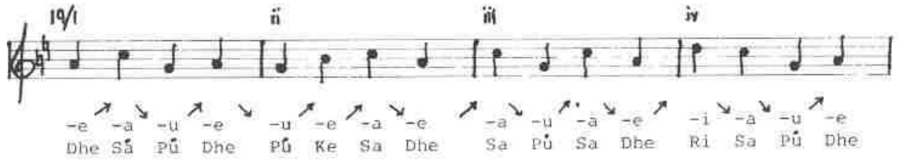
↗ = rising

↘ = falling

Example 2.

interpreted as indicating the direction of each melodic step, up or down, according to the principles set out in §5.

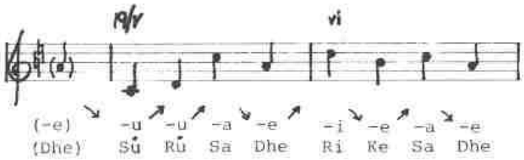
Taking into account the scale-degree indicated by the consonant-element of each note-symbol, the example may be transcribed as follows:



19/i
ii
iii
iv
-e -a -u -e -u -e -a -e -a -u -a -e -i -a -u -e
Dhe Sā Pů Dhe Pů Ke Sa Dhe Sa Pů Sa Dhe Ri Sa Pů Dhe

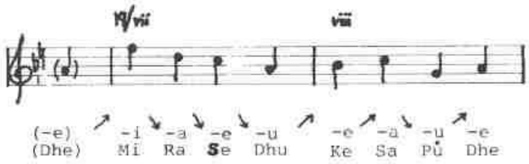
Example 3.

In Ex. 3 the four vowels are associated with five different pitches within the range of a fifth. In the following two measures, the range is extended downwards to a ninth, as is indicated by the falling interval Dhe Su (a′ c′):



Example 4.

In the next two measures, the ambitus of the melody increases by a third. This is indicated by the rising interval Dhe Mi (a′ f″), and entails a temporary change in the relationship of vowels and pitches. This change is demonstrated in Table X below.



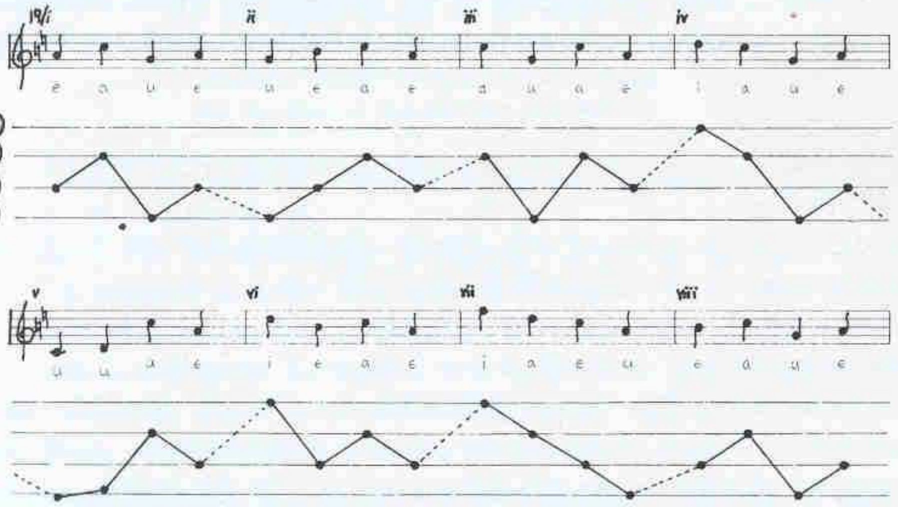
Example 5.

		19/i-vi	19/vii	19/viii
M-	(f″)	—	-i	—
R-	(d″)	-i	-a	—
S-	(c″)	-a	-e	-a
K-	(b′)	-e	—	-e
Dh-	(a′)	-e	-u	-e
P-	(g′)	-u	—	-u
(R-	(d′)	-u)	—	—
(S-	(c′)	-u)	—	—

Table X.

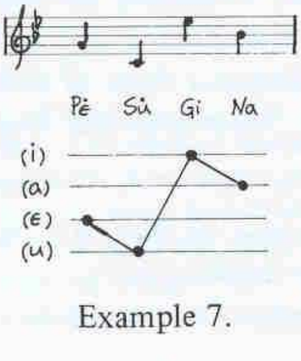
From this example it may be seen how, *in different contexts,* the same vowel-inflection may be applied to different pitches, and the same pitch associated with different vowel-inflections.

The same example, given in full below (Ex. 6), also shows that the choice of vowel-inflection for each note is influenced, inevitably, by wider considerations than the immediately preceeding or following note. For example, the choice of the vowels -e -a to notate the first two notes of line 19 (see Ex. 6) implies that a higher note than these, inflected -i, is to be expected. The expectation is fulfilled, but not until three measures later (measure iv). Similarly, the fact that the third note of line 19 is inflected -u, implies not only that it is lower than the second note, inflected -a, but also that it is lower than the first note, inflected -e. The point becomes clearer if one thinks of the vowels as indicating four 'pitch levels', variable as to absolute but never as to relative pitch; these are indicated beneath the staff in Ex. 6. The shape of the whole melody is expressed, by means of the vowel-inflections, in terms of movement between the four levels. The fact that the melody actually operates on more than four levels of *absolute* pitch is compensated partly by the shifts in the allocation of vowels to pitches, already demonstrated (Table X), and partly by the sharing of one level by adjacent pitches (for example, Dhe and Ke in 19/i-iv, Ex. 6). It is easy to see how this sharing of a 'pitch level' by adjacent notes might lead to the repetition of vowels in the context of small intervals (§13).


19/i
ii
iii
iv
ε a u ε u ε a ε a u a ε i a u ε
(i)
(a)
(ε)
(u)
v
vi
vii
viii
u u a ε i ε a ε i a ε u ε a u ε

Example 6.

These considerations remove the uncertainty (alluded to in §§7–9) as to which intervals (if any) are to be interpreted as intervals larger than the octave. The wider context generally makes this clear, as in the following example (Ex. 7), where the movement between pitch-levels demands a rising tenth c' - e^{b}'':



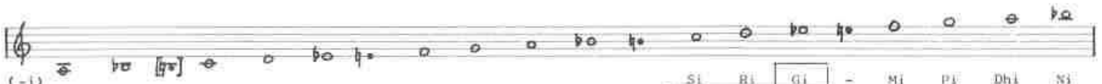
Example 7.

Any remaining ambiguity in such cases is removed by the superscript dots, the function of which will be explained in §16.

§15. A complete transcription of the music of the inscription is presented below, pp.144–150, in which the vowel inflections are interpreted along the lines suggested (§5). Where the notation admits of any uncertainty as to the exact pitch of a note,[38] I have avoided interpretations which would result in a complete change of register for the remainder of the melody. Except where the context demands an interval larger than an octave (§14), I have chosen at every point the smallest available interval that is compatible with the supposed directional indications of the vowel-notation (§5).

The minimum range required for such a transcription is found to be two octaves and one note. This is less than the three octaves recognised in contemporary theory (§2), but the indications are that the music of the inscription is instrumental,[39] and it is unlikely that the arched harps, short lutes and stick zithers represented in first-millenium iconography would have had a range much greater than two octaves.

Table XI shows the tonal material employed in the transcription. Each pitch is correlated with the symbols of the notation by which it is represented: thus c″ in the transcription is represented, in different contexts, by Si, Sa, Se and Su.



(-i)													Si	Ri	Gi	–	Mi	Pi	Dhi	Ni
(-a)								Mȧ	Pȧ	Dha	Na	Ka	Sa*	Ra	Ga	A	Ma	Pa		
(-e)				Sė	Rė	Gė	–	Mė	Pė	Dhe	Ne	Ke	Se	Re	Ge	E				
(-u)	Dhu̇	Nu̇	–	Su̇	Ru̇	Gu̇	U̇	Mu̇	Pu̇	Dhu	Nu	Ku	Su							

*Occasionally dotted

Table XI.

§16. Table XI also distinguishes between dotted and undotted forms. It will be observed that the occurrence of dotted forms is limited to the lowest seven notes of the range. For example, Su̇ appears only in contexts which require its transcription as c′, whereas Su appears only in contexts which require its transcription as c″. The dot therefore functions as an octave-marker: but it does not denote an octave *sa – ni*, as does the dot in modern *sārgam* notation, and as has been assumed to be the case in early Indian notations,[29] but an octave *dha – pa.* In other words, the dot marks, not a specific octave, but the lowest seven notes used.

§17. In Table XI the most frequent form of each note-symbol, derived from Table II, is enclosed in a box. These preferred forms correspond to the central octave of the range, *ma* – *ga*. It is significant that the hypothesis connects the most frequently occurring note-symbols with those notes which, by virtue of their position in the centre of the range, are inherently likely to occur frequently.

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[38] For instance at the beginnings of lines, after lacunae, or wherever there is an uncertain reading or apparent error.

[39] See pp.117 above and 137 below.

§18. It may be objected, that the transcription contains a significant number of wide leaps, including leaps of more than an octave. Where these implausibly disturb the melodic line, they may be the result of errors in the notation;[40] but it is significant that wide leaps only occur in certain positions. Table XII shows the number of times that sixths, sevenths, octaves, and larger intervals occur in the transcription between notes 1–2, 2–3, 3–4 and 4–1 of the four-note measure.

	Position in measure			
Interval	1-2	2-3	3-4	4-1*
8ve +	3	12	0	56
8ve	0	0	0	56
7th	4	20	0	46
6th	23	35	4	47
Total	30	67	4	205

* The interval between the last note of one measure and the first note of the next. Intervals between the last note of one line and the first of the next not included.

Table XII.

The table shows that intervals larger than a fifth occur most often between the last note of a measure and the first note of the next (4–1). Intervals of more than an octave also occur, less frequently, between notes 2 and 3, but rarely between 1 and 2, and never between 3 and 4. Sevenths and sixths are similarly distributed, although these occur more frequently within the measure. Thus wide leaps occur predominantly between the boundary-notes of measures (4–1) and of half-measures (2–3): an association which is unlikely to have arisen fortuitously in an incorrect transcription. The leaps should therefore be regarded as a stylistic and formal feature, and attributed perhaps to instrumental rather than to vocal technique.

§19. For further confirmation that our interpretation of the vowel-inflections is correct, we may refer again to the symbols A- and K-. As stated earlier (p.123), these symbols alone do not take the -i vowel-inflection: there is no *I or *Ki, a fact for which no explanation has previously been offered. It has now been established that the -i vowel occupies the highest position in a rank order of vowels (§5); it must therefore be followed by a lower-ranking vowel-inflection. According to the hypothesis, movement from a high-ranking vowel to a low-ranking vowel denotes a descending interval (§5). However, it has been shown (p.127) that it is the special function of A- and K- to lead to the notes next above, and that they are therefore always followed by a rising interval. The -i vowel-inflection therefore cannot be applied to them. For the same reason, it is not applied to the notes Dh- and R- in the Madhyamagrāma rāga (Table IV), where these notes fulfil a similar leading-note function.

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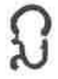
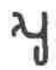
[40] The published texts mention a number of instances in the inscription where an incorrect character has apparently been engraved and subsequently corrected. In several cases the original mistake, where legible, would contravene the principles of the vowel-notation: cf. 4/v, third note; 3/xi, third note; 13/xiv, second note; 26/ix, first note. Besides supporting our interpretation of the vowel-notation, these cases suggest that uncorrected errors are also likely to occur in the inscription.

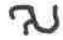
§20. Finally, the significance of the vowel-inflections deduced in §5 may be considered in relation to their pronunciation and written forms. The choice of the vowels -i and -u to denote high and low relative pitch respectively is particularly appropriate, since these vowels are articulated respectively at the front and back of the mouth. This distinction is reflected in the signs by which these two vowels are written in the Pallava-grantha script of the inscription: -i is denoted by a loop *above* the consonant-character, and -u by a hook *below*:

 = Si

 = Su

The vowels -a and -e, on the other hand, are both articulated in the middle of the mouth, and in the notation they similarly represent areas of relative pitch between the extremes of high and low. In the Pallava-grantha script, -a has no sign additional to the consonant-character, and -e is represented by a hook to the left. Neither vowel, therefore, is denoted by a sign with explicit directional indications:

= Sa

 = Se

Thus the attributes of the four vowels, as spoken and written, are to some extent reflected in their function in the notation of the Kuḍumiyāmalai Inscription. The *anusvāra* or nasal ṃ, written as a superscript dot, was also considered a vowel, articulated further back in the mouth than -u. From the phonetic point of view, therefore, this symbol is also appropriate to its function in the notation of the inscription.[41]

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[41] I am indebted to Dr. Marr for this observation. I am also grateful to Professor F. R. Allchin for the suggestion that a similar association of vowels and musical pitch is to be found in the syllabic mnemonic notations for drum, which are widely used in North and South India today and which are first illustrated in BhNŚ (ch. 33). The extent to which these notations correlate front vowels with high pitch and back vowels with low pitch is difficult to determine; however, in the notations for the North Indian *tāblā* and *pakhāvaj* the vowel i does seem to be restricted to strokes on the higher-pitched of the two drum-heads (Kaufmann *op. cit.* pp.224ff.; L. Garg, ed., *Saṅgīt* (*Mṛdaṃg aṃk*), Hathras 1965, plates between pp.56 and 57). Such correlations also occur outside India, notably in the Korean *yuk-po* syllabic notation, in which 'syllables with dark vowels, such as u or o, represent lower sounds, with brighter vowels, a, e or i, representing higher sounds . . . The highest sounds are denoted by syllables with the vowel i . . .' (Kaufmann *op. cit.*, p.167).

THE VOWEL NOTATION: SUMMARY

To determine the significance of the vowel-inflections of the Kuḍumiyāmalai Inscription, we have examined their function in the notation of successive notes. It was observed (§4) that specific sequences of vowels are associated with intervals previously identified as rising semitones (§3). This observation was explained (§5) by ranking the vowels in the ascending order -u -e -a -i; it was proposed that progression from a low-ranking to a high-ranking vowel indicates a rising interval, and *vice versa*. This hypothesis was then tested by statistical analysis of all note-sequences in the inscription (excluding octaves and uncertain readings) (§§7–13). It was first predicted (§6) that, if the hypothesis was correct, small intervals – seconds, thirds and fourths – should result more frequently than their larger inversions – sevenths, ninths etc. The conclusion drawn from the analysis (§13) was that the hypothesis yields the expected result, and is therefore likely to be correct.

Turning to the notation of the melodic line *in extenso*, we have seen how '*in different contexts*, the same vowel-inflection may be applied to different pitches, while the same pitch may be associated with different vowels'. The total range required for the transcription of the music of the inscription was established (§15) as two octaves and one note, and the constituent pitches of this range were correlated with the note-symbols by which they are represented in the inscription (Table XI). It was consequently discovered (§16) that the superscript dot marks notes which fall within the lowest octave of the range; and that the most frequent note-symbols are plausibly associated with pitches within a central octave of the range (§17). Large leaps were found to occur only in certain positions in the four-note measure (§18).

Finally, it was shown (§19) that this interpretation of the vowel-notation accounts for the absence of the forms *I and *Ki, and that the functions of the four vowels and the superscript dot reflect to some extent their spoken and written forms (§ 20).

There is thus a large body of internal evidence that confirms the interpretation of vowels here suggested.

THE MUSIC OF THE INSCRIPTION AND *SVARAPRASTĀRA*

A detailed analysis of the formal and modal structure of the music of the inscription is beyond the scope of the present study. However, some light may be cast on the nature and purpose of this music by returning to the features of musical style mentioned on p.123.

Within any one line of the inscription, the final note of every measure is the same (apart from octave displacement: see transcription). For example, in the first line of the first rāga (Madhyamagrāma) the final note of every measure is C. In successive lines, however, different notes fulfil this function. Only those notes that are strong (that is, frequent) notes of the rāga concerned appear as measure-finals. Thus in the Madhyamagrāma rāga, there are five lines, in which measures end on C, E^b, G, B^b and F respectively: the weak notes A and D are not used as measure-finals. The measure-finals are almost always taken in ascending scale order, except that the overall final for the rāga (in this case F) is reserved to the last line in order to fulfil its proper function.

Within each measure, immediate repetition of a note is consistently avoided; octaves occur only between the last note of one measure and the first note of the next. Similarly, repeated measures are avoided. If we consider that each measure comprises three intervals (between notes 1–2, 2–3, and 3–4), we find that in each line, more different intervals occur in first than in second position, and more in second than in third. For example, in the first line of the inscription, 16 different intervals occur in first place, 11 in second place, and 6 in third place. The melody is therefore characterised by frequent change at the beginnings of measures, and by infrequent change at the ends of measures.

Certain features of the Kuḍumiyāmalai music may also be found in a quasi-mathematical technique of note-permutation, first described in detail by Śārṅgadeva (*ca* A.D. 1200–1250)[42] and still used today, called *svaraprastāra*, of which a full account has been given by Jairazbhoy.[43] As formulated by Śārṅgadeva, the purpose of this technique was to produce all the possible permutations of a given sequence of different notes, in a logical order and without repetition, according to a mathematical formula. Given a sequence of different notes 1 2 3 4 (shorter or longer sequences are also possible), the final note is held at the end while notes 1, 2, and 3 are rotated: 1 2 3 4, 2 1 3 4, 1 3 2 4, 3 1 2 4, 2 3 1 4, 3 2 1 4. Then 3 is placed in the final position and 1, 2, and 4 rotated in the same way: 1 2 4 3, 2 1 4 3 etc. Then 2 and in due course 1 are placed in the final position, and the other notes rotated, until all permutations of the four notes have been exhausted.

So far as is known, Śārṅgadeva in the thirteenth century was the first to produce a mathematical formula for the permutation of notes: a reference in the *Bṛhaddeśī* of Mataṅga[44] suggests that in earlier centuries, such permutation was practised more freely. Śārṅgadeva's method is still practised by student and professional performers.[43]

The *svaraprastāra* technique and the music of the Kuḍumiyāmalai Inscription have several features in common. In both cases,

1) the final note of successive measures/permutations remains the same for long periods, while

2) the preceding notes are continually changing, there being no repetition of measures/permutations;

3) change takes place most frequently at the beginnings of measures/ permutations;

4) repeated notes and octaves are avoided;

5) leaps – melodic intervals greater than a second – are frequently encountered;

6) there is no rhythmic variation.

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[42] Śārṅgadeva: *Saṅgītaratnākara* 1.4.62f. (ed. Subrahmanya Śāstrī, vol. I, Adyar 1943).

[43] N. A. Jairazbhoy, 'Svaraprastāra in North Indian classical music', in *Bulletin of the School of Oriental and African Studies*, 1961, pp.307–25.

[44] MBD p.31.

The didactic purpose of the inscription is explicit in the Sanskrit colophon ('Texts of notes made for the benefit of pupils. . .'). However, it must be emphasised that whereas the *svaraprastāra* in its strict form is a purely mathematical procedure, allowing no scope for creative invention, *the Kuḍumiyāmalai music is not governed by any discernible mathematical formula.* On the contrary, it takes full account of the melodic characteristics of each rāga.

The way in which the vowel-notation determines the direction of each successive step in every line, suggests that each line was regarded as a continuous melody, not as a series of unconnected four-note fragments. Similarly, the fact that the final of each rāga appears as measure-final only in the last line of each section, shows that each section was regarded as a single composition, not as a succession of independent lines.

The music of the inscription is therefore an elaborate exposition and development of the melodic material of each rāga, in a style which may later have been reduced to the mathematical formula of *svaraprastāra*. Such an elaborate exposition of musical materials, involving both extended melodic development and a unique notational device (the vowel-notation), is perhaps to be associated with a powerful political figure well known for his patronage of the arts. In the absence of any indication as to its authorship in the text of the inscription, apart from the reference to an anonymous king and his preceptor, and in the light of the epigraphical evidence (p.121), such a figure can be found in the Pallava emperor Mahendravarman I.

ADDENDUM: CHARACTERS ADDITIONAL TO THE PUBLISHED TEXTS.

As noted on p.117, the later masonry porch to the right of the inscription obscures a few characters at the ends of lines 32–38. The texts of the inscription published in *Epigraphia Indica* and *Inscriptions of Puḍukottai State* also show lacunae at the ends of lines 28–31. However, examination of the inscription itself in 1976 showed that the final characters of lines 28–31 are for the most part not obscured by the masonry and can be clearly read, although they do not appear in the published estampage (reproduced on pp.118, 119). They have therefore been incorporated in the transcription. The new characters are:

line 28:	texts:	Mė	[Si]	–	–
	inscription:	Mė	Si	[Dha]	–
line 29:	texts:	Sa	Ke	–	–
	inscription:	Sa	Ke	Mi	–
line 30:	texts:	Ma	Dhi	–	–
	inscription:	Ma	Dhi	Mu̇	Dhe ||| ::
line 31:	texts:	Dhe	[Sa]	–	–
	inscription:	Dhe	Sa	Ru̇	Mė

By removing dust and decayed vegetable matter from cracks in the masonry, and with the aid of a lighted match, it was possible to read a few characters at the ends of lines 32–36. These, which have also been incorporated into the transcription, are set out below.

line 32:	texts:	Na	[Si]	–	–	–	–			
	inscription:	Na	Si	–	–	–	–			
line 33:	texts:	Ma	[Pi]	–	–					
	inscription:	Ma	Pi	Ma	–					
line 34:	texts:	Ma	Sa	–	–		–	–	–	–
	inscription:	Ma	Sa	–	∸		–	[U]	[Me]	–
line 35:	texts:	E	–		–	–	–	–		
	inscription:	E	Ma		–	–	–	–		
line 36:	texts:	–	–	–	–		–	–	–	–
	inscription:	–	–	[M∸]	[Dhe]		–	–	–	–

ACKNOWLEDGEMENTS

This study is the revised version of an M.A. dissertation prepared and presented at the School of Oriental and African Studies, London, under the guidance of the late Mrs Rajeshwari Datta, in 1974. I am grateful to Mrs Datta, to Dr. L. E. R. Picken, and to Professor F. R. Allchin, for their help and encouragement, and to Mrs M. M. Collins for typing the tables.

NOTES ON THE TRANSCRIPTION

For the texts of the inscription on which the transcription is based, see p.115 and n. 1. Where a choice has been made between two alternative readings, the rejected reading is noted at the foot of the page: B. = Bhandarkar (*Epigraphia Indica*), S. = Sathyanarayana (based on *IPS*).

For the transcription method, see §15, p.136. The vowel-inflection of each note-symbol has been included in the transcription below the staff; superscript dots are shown, where appropriate, above the vowels. Each line of the inscription is transcribed on two staves, the upper giving measures i-viii, the lower measures ix-xvi. Vertical bar-lines denote the division of the music (in the inscription, by spacing) into four-note measures. The punctuation-marks at the ends of lines appear to be merely calligraphical elaborations of the standard period-sign ||.

[ ] = uncertain reading or missing character(s)

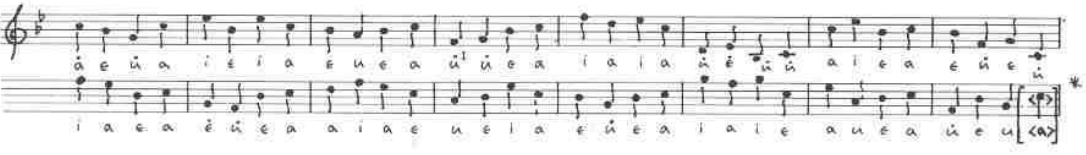
< > = editorial restoration or emendation

Editorial restorations and emendations have been ignored in preparing the statistical evidence presented in this study.

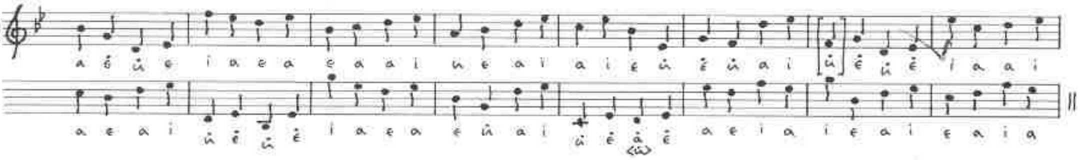
(I.) *madhyamagrāme catuṣprahārasvarāgamāḥ*

Texts of notes in four strikings, in Madhyamagrāma (rāga).

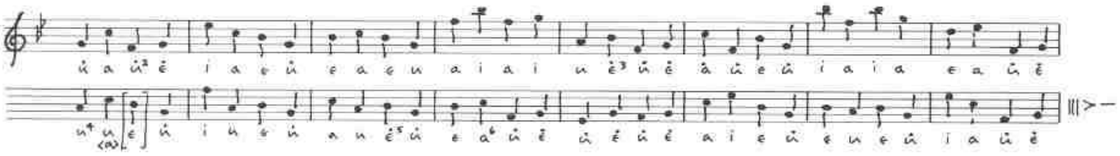
(1.)


à e ù a i ɛ i a ɛ u ɛ a ù[1] ù e a i a i a ù è ù ù a i ɛ a ɛ ù ɛ ù
i a ɛ a è ù ɛ a a i a ɛ u ɛ i a ɛ ù ɛ a i a i ɛ a u ɛ a ù ɛ u <a>
*

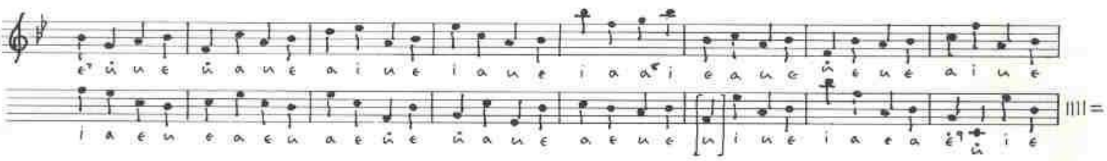
(2.)


a è ù e i a e a e a a i u e a i a i ɛ ù è ù a i ù è ù è i a a i
a e a i ù è ù è i a e a è ù a i ù è à è <ù> a e i a i ɛ a i ɛ a i a

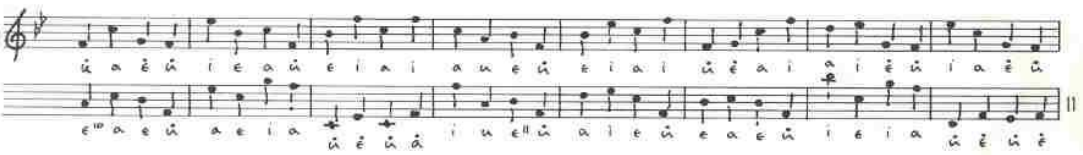
(3.)


ù a ù[2] è i a e ù ɛ a ɛ u a i a i u è[3] ù è à ù e ù i a i a ɛ a ù è
u[4] u <a> ɛ ù i u e ù a u ɛ[5] ù ɛ a[6] ù è ù è ù è a i e ù ɛ u ɛ ù i a ù è
|||>—

(4.)


ɛ[7] ù u ɛ ù a u ɛ a i u e i a u ɛ i a a[8] i e a u e ù ɛ u ɛ a i u ɛ
i a ɛ u e a ɛ u a ɛ ù ɛ ù a u ɛ a ɛ u e u i u ɛ i a e a ɛ[9] ù i ɛ
||||=

(5.)


ù a è ù i ɛ a ù ɛ i a i a u ɛ ù ɛ i a i ù è a i a i è ù i a è ù
ɛ[10] a e ù a e i a ù è ù à i u ɛ[11] ù a i ɛ ù e a ɛ ù i ɛ i a ù è ù è

samāptāḥ sva<rāgamāḥ>

[The texts of notes] are finished.

---

* final note and punctuation missing

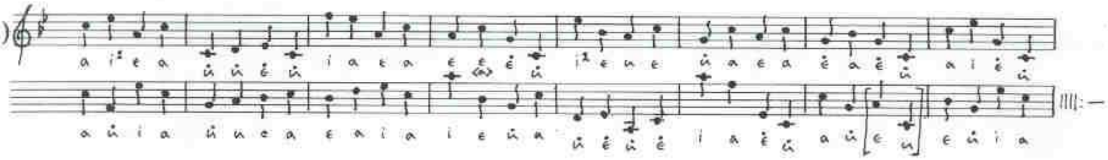
[1] B.: Mu [2] B.: [Mù] [3] B.: [Nè] [4] B., S.: corrected from Dhi

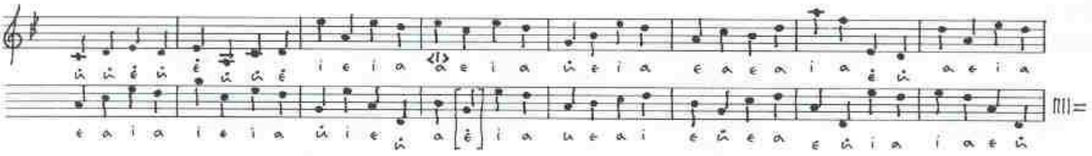
[5] B.: corrected from Nu; S.: corrected from Ne (?) [6] S.: Sà [7] S.: Nė

[8] B., S.: corrected from Pi [9] B.: Pe [10] S.: Dhė [11] S.: Nè

(II.) *ṣaḍjagrāme catuṣprahārasvarāgamāḥ*

Texts of notes in four strikings, in Ṣaḍjagrāma (rāga).

(6.)


(7.)


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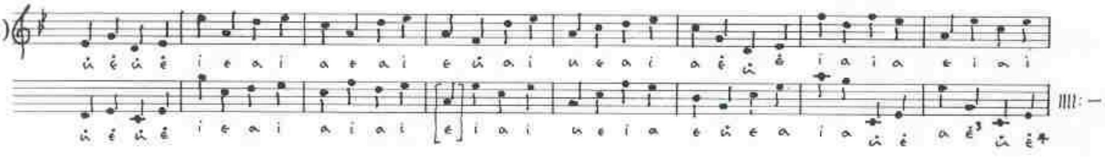

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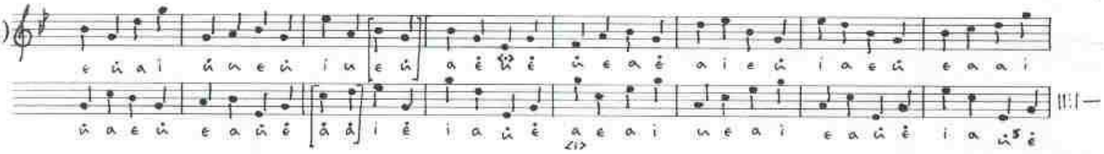
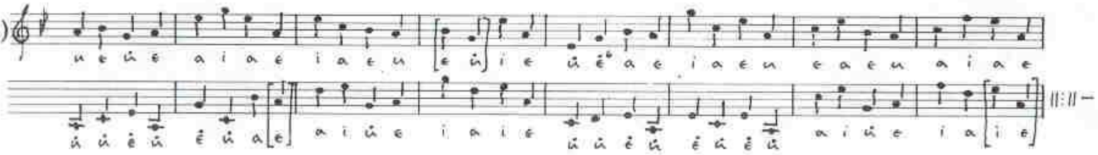


(10.)


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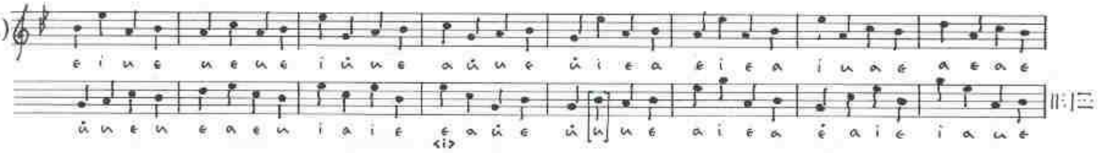
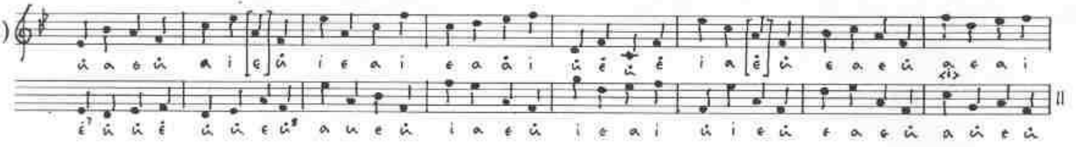


(12.)


samāpt<āḥ svarāgamaḥ>

[The texts of notes are finished.]

---

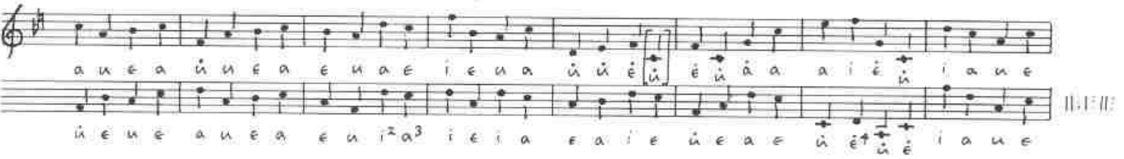
[1] B., S.: -e inflection also attached to this character [2] B.: Gī

[3] B.: Pe [4] S.: Ge [5] B.: Gá [6] B.: Pá [7] B.: Ge [8] S.: Mu

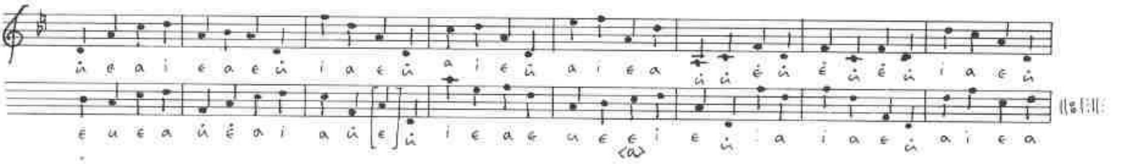
(III.) *ṣāḍave*[1] *catuṣprahārasvarāgamāḥ*

Texts of notes in four strikings, in Ṣāḍava (rāga).

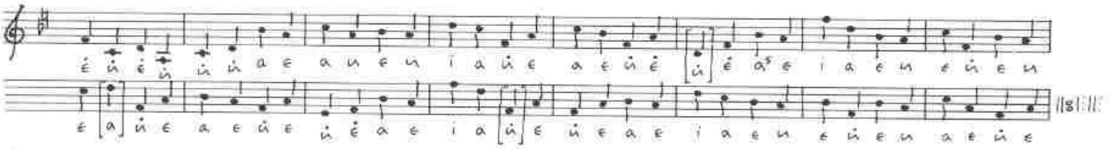
(13.)



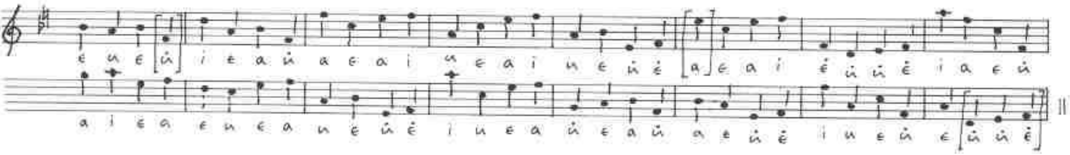
(14.)



(15.)



(16.)



samāptāḥ <svarāgamāḥ>

[The texts of notes] are finished.

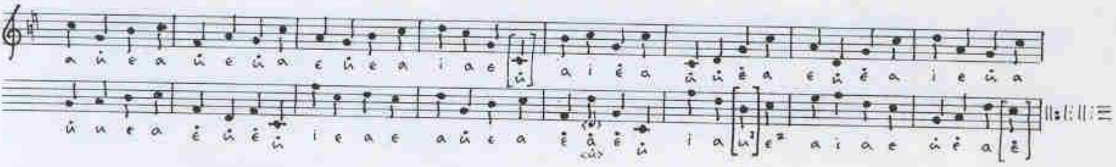
---

[1] B.: *ṣāḍabe* [2] S.: Rī [3] S.: Sá [4] S.: Ré corrected from Rá [5] S.: Nā

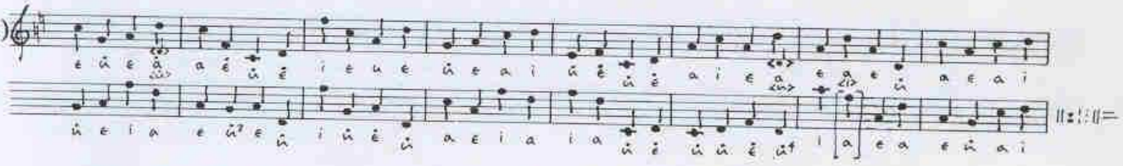
(IV.) *sādhārite catuṣprahārasvarāgamāḥ*

Texts of notes in four strikings, in Sādhārita (rāga).

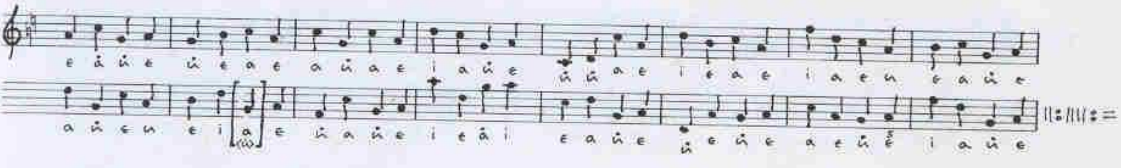
(17.)



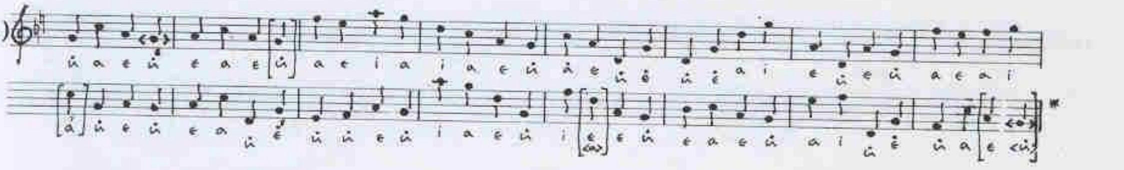
(18.)



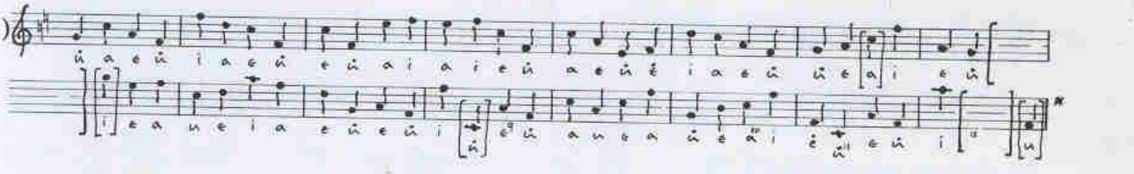
(19.)



(20.)



(21.)



* punctuation missing

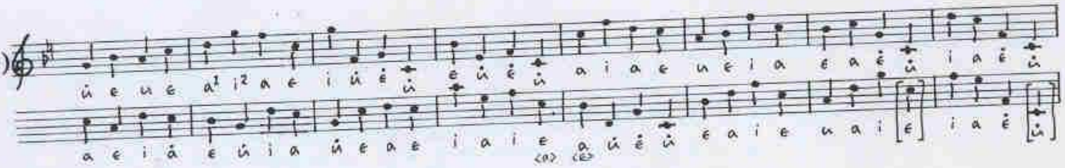
[1] B.: Ka; S.: [Ku]   [2] B.: [Se]   [3] B.: [Pù]   [4] B.: [Rà], possibly Rù

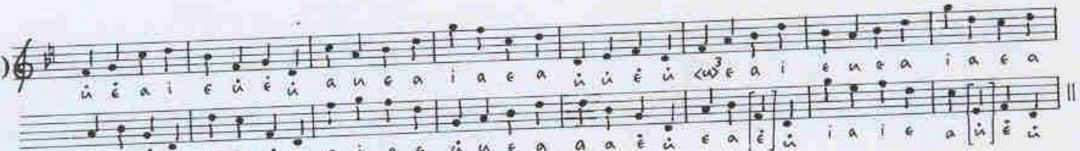
[5] S.: Dhè   [6] B., S.: Mù   [7] B.: [Se]   [8] B.: Pà   [9] S.: Dhè   [10] S.: Se

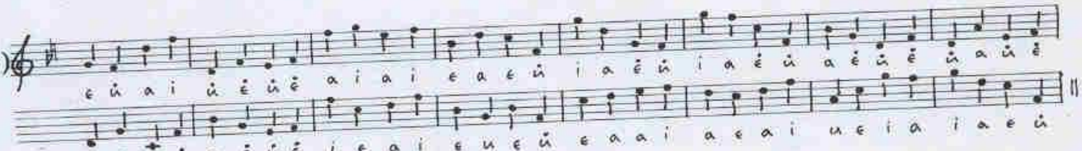
[11] S.: Su   [12] S., B.: ?Ne

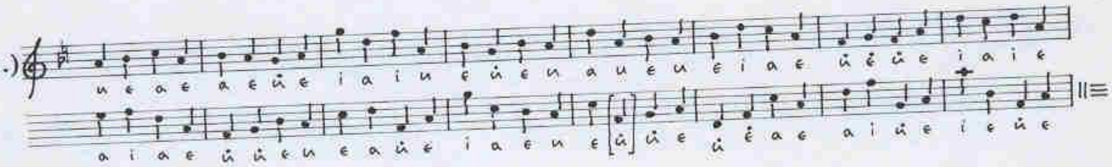
(V.) *pañcame catuṣprahārasvarāgamāḥ*

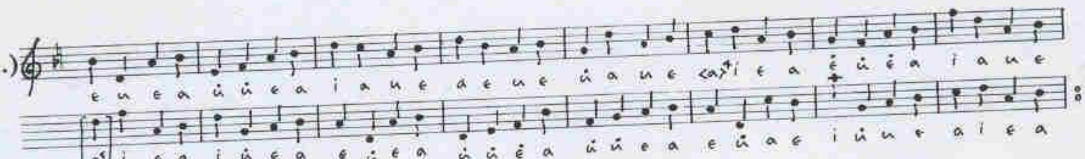
Texts of notes in four strikings, in Pañcama (rāga).

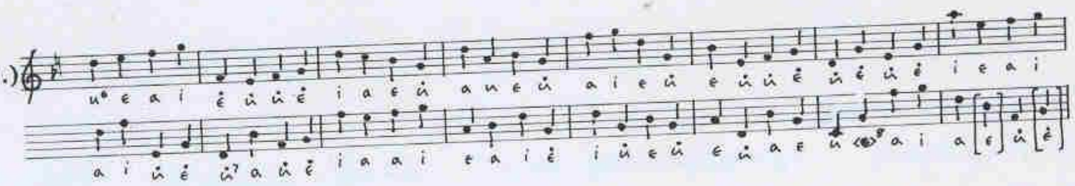
(22.)


(23.)


(24.)


(25.)


(26.)


(27.)


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* punctuation missing

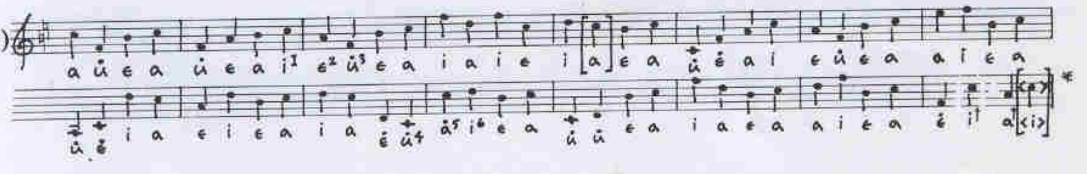
[1] S.: Ri [2] S.: Pa [3] B., S.: Ma [4] B., S.: Su [5] B., S.: corrected from Ri

[6] B.: Ra [7] S.: Ru [8] B., S.: Pa

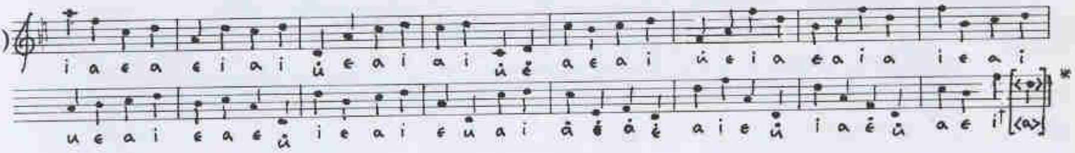
(VI.) *kaiśikamadhyame catuṣprahārasvarāgamāḥ*

Texts of notes in four strikings, in Kaiśikamadhyama (rāga).

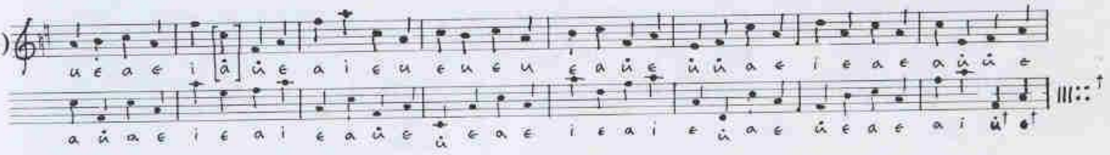
(28.)


a u̇ e a u̇ e a i¹ e² u̇³ e a i a i e i [a] e a u̇ ė a i e u̇ e a a i e a
u̇ ė i a e i e a i a ė u̇⁴ ȧ⁵ i⁶ e a u̇ u̇ e a i a e a a i e a ė i† a† [‹a›] [‹i›] *

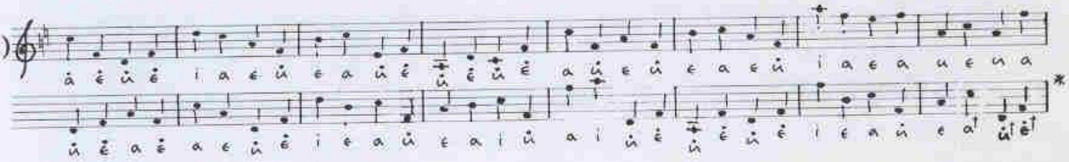
(29.)


i a e a e i a i u̇ e a i a i u̇ ė a e a i u̇ e i a e a i a i e a i
u e a i e a e u̇ i e a i e u̇ a i ȧ ė ȧ ė a i e u̇ i a ė u̇ a e i† [‹a›] [‹a›] *

(30.)


u e a e i [ȧ] u̇ e a i e u e u e u e a u̇ e u̇ u̇ a e i e a e a u̇ u̇ e
a u̇ a e i e a i e a u̇ e u̇ e a e i e a i e u̇ a e u̇ e a e a i u̇† e† III::†

(31.)


ȧ ė u̇ ė i a e u̇ e a u̇ ė u̇ ė u̇ ė a u̇ e u̇ e a e u̇ i a e a u e u a
u̇ ė a ė a e u̇ ė i e a u̇ e a i u̇ a i u̇ ė u̇ ė u̇ ė i e a u̇ e a† u̇† ė† *

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* punctuation missing

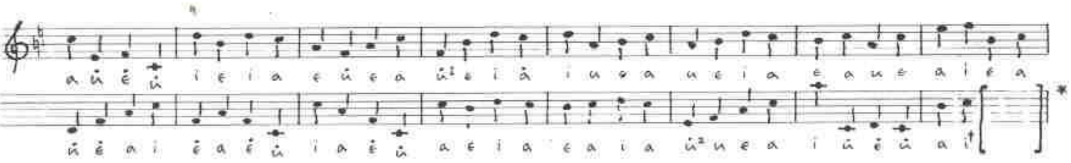
† see Addendum, p.

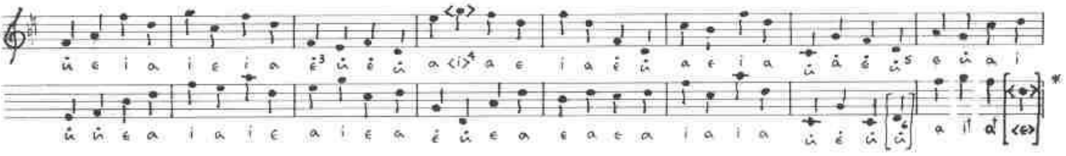
[1] S.: Se [2] S.: Dhȧ [3] S.: Mu (Me?) [4] B.: Sȧ [5] B., S.: originally written Ṣù

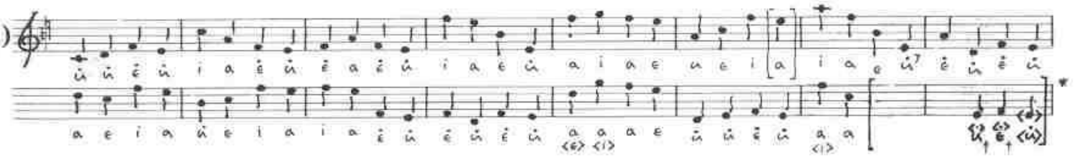
[6] S.: Dhȧ

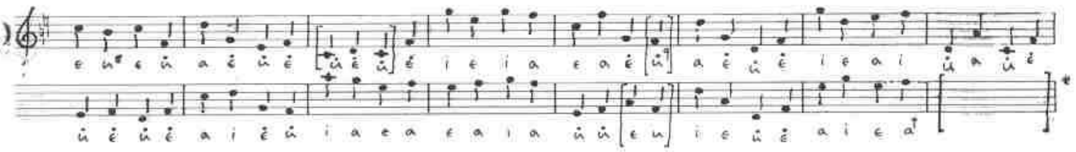
(VII.) *kaiśike catuṣprahārasvarāgamāḥ*

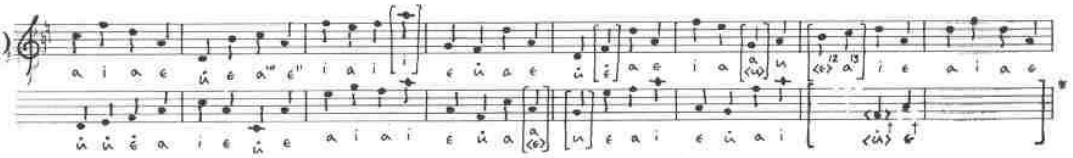
Texts of notes in four strikings, in Kaiśika (rāga).

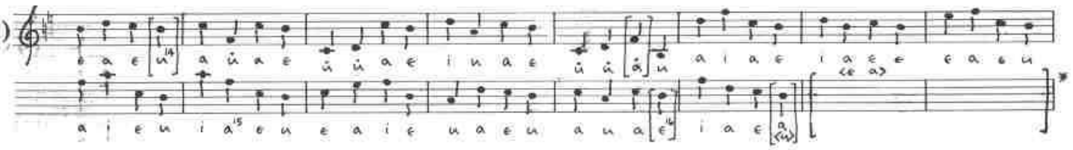
(32.)


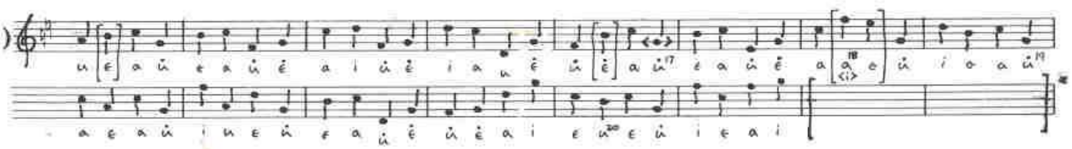
(33.)


(34.)


(35.)


(36.)


(37.)


(38.)


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* final notes and punctuation missing

† see Addendum, p.142

[1] S.: Mu
[2] S.: U
[3] S.: Me
[4] B., S.: Mi (B. emends to Pa)
[5] B.: Mė Pȧ
[6] B., S.: Rȧ, possibly Rė or Rů
[7] S.: U
[8] S.: Ků
[9] B.: Mȧ
[10] S.: Sȧ
[11] B.: Dhė
[12] B.: [Ku]; S.: [Ra]
[13] B.: Ma
[14] B.: Ka
[15] B.: Mȧ
[16] S.: Kė
[17] B., S.: Mů
[18] B., S.: Mi possible
[19] S.: Pȧ
[20] B.: Ků